

$$\begin{aligned} & \left\{ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 24 \\ 25 \\ 26 \\ 27 \\ 28 \\ 29 \\ 30 \\ 31 \\ 32 \\ 33 \\ 34 \\ 35 \\ 36 \\ 37 \\ 38 \\ 39 \\ 40 \\ 41 \\ 42 \\ 43 \\ 44 \\ 45 \\ 46 \\ 47 \\ 48 \\ 49 \\ 50 \\ 51 \\ 52 \\ 53 \\ 54 \\ 55 \\ 56 \\ 57 \\ 58 \\ 59 \\ 60 \\ 61 \\ 62 \\ 63 \\ 64 \\ 65 \\ 66 \\ 67 \\ 68 \\ 69 \\ 70 \\ 71 \\ 72 \\ 73 \\ 74 \\ 75 \\ 76 \\ 77 \\ 78 \\ 79 \\ 80 \\ 81 \\ 82 \\ 83 \\ 84 \\ 85 \\ 86 \\ 87 \\ 88 \\ 89 \\ 90 \\ 91 \\ 92 \\ 93 \\ 94 \\ 95 \\ 96 \\ 97 \\ 98 \\ 99 \\ 100 \end{array} \right\} \end{aligned}$$

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TECHNICAL FIELD OF THE INVENTION

The present invention relates generally to the field of telecommunication systems, and more particularly to skills-based routing of a communication session.

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In accordance with the present invention, a method is provided for skills-based routing of a communication session received at a switch. In a particular embodiment, the present invention provides a method for skills-based routing of a communication session received at a switch, where a server generates a profile of the communication session and compares the profile to a skills table resulting in a selection of a service agent station.

According to one embodiment of the present invention, a method for skills-based routing of a communication session received at a switch includes: receiving a request to establish a communication session
15 between a client and one of a plurality of service agent stations; generating a profile of the communication session in response to the request, wherein the profile of the communication session comprises at least two attributes; comparing the profile of the communication
20 session to a skills table, wherein the skills table associates a service agent to a plurality of skill entries in a service agent record; and selecting one of the service agent stations in response to comparing the profile of the communication session to the skills table.

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In accordance with yet another embodiment, the present invention provides a method for dynamically updating a skills table, the method comprising the following steps performed at a server remotely located from a switch: receiving service agent information; storing the service agent information on the server; updating a skills table utilizing the service agent information, wherein the skills table associates each service agent to a plurality of skill entries in a service agent record; and communicating the skills table to a switch remotely located from a server.

Further technical advantages include the dynamic
30 update of the skills table utilizing service agent
information collected at a server remotely located from
the switch. The service agent information may be

Other technical advantages of certain embodiments of the present invention include linking the generated ordered list to a workflow management system. In this manner, the unavailable service agent stations can be removed from the ordered list and the client does not remain in a queue longer than necessary. Other technical advantages of the present invention will be readily apparent to one skilled in the art from the following figures, descriptions and claims.

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BRIEF DESCRIPTION OF THE DRAWINGS

For a more a complete understanding of the present invention and its advantages, reference is now made to the following descriptions, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 provides a conceptual illustration of a system for skills-based routing of a communication session in accordance with the present invention;

FIGURE 2 provides a conceptual illustration of associated components for dynamically updating a service agent skills table with qualitative and quantitative data;

FIGURE 3 provides a conceptual illustration of a remotely located server in the system;

FIGURE 4 provides a conceptual illustration of a service agent skills table;

FIGURE 5 is a flowchart of a method for routing a communication session received at a switch utilizing a dynamic service agent skills table; and

FIGURE 6 is a flowchart of a method for dynamically updating the skills table with qualitative and quantitative data.

DETAILED DESCRIPTION OF THE INVENTION

FIGURE 1 provides an illustration of a system 10 for skills-based routing of a communication session received at a switch 14. System 10 may be a distributed environment linked through a network 32 such as the Internet, a local area network (LAN), a wide area network (WAN), or other wireless or wireline communication network. Generally, network 32 may include any combination or arrangement of components in software and/or hardware that perform packet-based, circuit switched, or other form of communicating information between a client 12 and a service agent station 16. In general, switch 14 directs sessions initiated by clients 12 to appropriate stations 16 using a profile of the session and a service agent skills table.

System 10 includes switch 14, which may be digital, analog, packet-based, circuit-switched, or other form of switching and/or communication capability in hardware and/or software. Switch 14 is capable of communicating to a public telephone system, a private line system or a network, that routes a communication session between client 12 and service agent station 16. Additionally, switch 14 may be a virtual switch in a distributed environment.

Client 12 may be a telephone, a computer, or any other instrument capable of communicating with system 10, possibly through a trunk line 30. Service agent station 16 is a workstation which may include a telephone, a computer, or any other device which may be used to conduct communications with system 10 and client 12. System 10 also contemplates service agent station 16 communicating from a remote location in a distributed

System 10 includes a server 20, which may include memory 28 storing a skills table 104. Memory 28 comprises random access memory (RAM), read-only memory (ROM), CD-ROM, removable or fixed magnetic or optical storage media, or any other suitable volatile or non-volatile memory. Skills table 104 is a data structure stored in memory 28 that is dynamically updated by service agent information 22. Additionally, system 10 includes an administrative workstation 26 linked to server 20 to allow for the proper administration of system 10. System 10 may also include a workflow management system 24 that measures the quantitative data concerning one or more communication sessions between client 12 and service agent station 16 and records the availability of service agent station 16.

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System 10 communicates the client identifier data to server 20 remotely located from switch 14. Server 20 compiles the available client identifier data, whether active or passive, and uses the data to generate a profile of the communication session. The profile includes a number of attributes identifying client 12 and the needs of client 12. If necessary, server 20 converts the attributes of the profile into numeric values. Server 20 uses one or more algorithms to apply arithmetic calculations to the attributes. Next, server 20 compares each attribute to the corresponding skill in skills table 104. Server 20 subjects the results of the comparison to computations which prioritize the various skills entries extracted from skills table 104.

Once the comparison of skills table 104 and the profile is complete, server 20 selects one service agent station 16 utilizing the prioritized results. System 10 associates each service agent record with one service agent station 16. An ordered list may include all or a subset of service agent records. In one embodiment, the ordered list of service agent records is linked to workflow management system 24 to determine the availability of the preferred service agent station 16. For example, if the preferred service agent station 16 may be unavailable, server 20 removes the service agent record from the ordered list in order to reduce the queue time of client 12. The next service agent station 16 in the ordered list is then evaluated for availability. In another embodiment, all of the unavailable service agent stations 16 are first removed from the ordered list, then the preferred service agent station 16 is selected from the remaining service agent records.

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FIGURE 2 provides a conceptual illustration of associated components for dynamically updating a service agent skills table 104 with service agent information 22. Supervisor workstation 52 is coupled to system 10 and may include a computer, a telephone, or other components used to link to system 10 and can be onsite or remote. System 10 also allows for a client 56 to connect through a network-based interface 54. Client 56 may be a telephone, a computer, or any other instrument capable of communicating with system 10. Interface 54 may be through the Internet, a local area network (LAN), a wide area network (WAN), or other wireless or wireline communication network.

In operation, system 10 compiles raw service agent information in order to dynamically update skills table 104. Once compiled, the server converts the raw service agent information to numeric values. After server 20 obtains the numeric values, server 20 dynamically updates skills table 104 stored in memory 28. The updating of skills table 104 can occur on an as-needed basis, on request, or at predetermined intervals. Additionally, a user of administrative workstation 26 can manipulate the data at any step whether the data is the raw data, the numeric values, and/or data located in skills table 104. The server then communicates the updated skills table 104 to switch 14. Server 20 can communicate skills table 104 to switch 14 either whole or in part.

One embodiment of system 10 compiles service agent information 22 through the use of automated agent 18. Once the communication session between client 12 and service agent station 16 is complete, switch 14 routes client 12 back to automated agent 18 where, for example,

a survey may be conducted. Automated agent 18 queries client 12 concerning the performance of service agent station 16. Automated agent 18 collects the responses from client 12 and communicates the responses to server 5 20, where the responses may be subjected to numeric manipulation. Server 20 uses the resulting numeric values to dynamically update skills table 104.

Another embodiment of system 10 compiles service agent information 22 through the use of a supervisor 10 located at supervisor workstation 52. The supervisor monitors, either delayed or in real-time, the communication session between client 12 and service agent station 16. For example, the supervisor records a particular communication session, have the communication 15 session transcribed, and read a copy of the communication session on his workstation. In another example, the supervisor utilizes his telephone and monitors the communication session as the session occurs.

After the monitoring, the supervisor rates the 20 service agent located at service agent station 16 on one or more skills. These skills may include, for example, language proficiency, knowledge of the subject matter of the communication session, length of the communication session, politeness of the service agent station 16, or 25 overall client satisfaction. The supervisor then communicates raw data 102 to system 10 in order for raw data 102 to be converted into numeric values. In one example, the supervisor uses a networked application to provide feedback on a service agent.

30 System 10 may also include the use of workflow management system 24 to compile quantitative data. This quantitative data may include, for example, the number of

communication sessions handled by service agent station 16 in a set amount of time. Workflow management system 24 may also generate data concerning items such as the average length of a communication session, the number of
5 work breaks taken by service agent station 16, or the number of vacation or sick days taken by service agent station 16. Workflow management system 24 communicates the data to server 20.

System 10 may also utilize network-based interface
10 54. Interface 54 allows a remote or local client 56 to connect to system 10 and provide service agent information. Interface 54 queries client 56 on a recent communication session between client 56 and service agent station 16. Interface 54 retrieves the answers given by
15 client 56. Interface 54 then communicates the answers to server 20. If necessary, server 20 converts the answers into numeric values for use in updating skills table 104. The information retrieved from client 56 may include data pertaining to overall client satisfaction, whether the
20 communication session resulted in a successful conclusion, or any number of other data elements which may be capable of being measured qualitatively.

Once the raw data is gathered and converted into numeric values, server 20 uses the numeric values to
25 dynamically update skills table 104 stored in memory 28. Server 20 then communicates updated skills table 104 to switch 14. This update can occur at predetermined times or upon request and may comprise of all or a subset of the skills table 104.

30 FIGURE 3 illustrates an exemplary structure of server 20 remotely located from switch 14. Server 20 includes a processor 100, memory 28 and a number of

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interfaces 108. Interfaces 108 may include links to switch 14, network 54, supervisor workstation 52, the Internet, phone lines or any other component capable of transmitting data to or receiving data from server 20.

5 In normal operation, each interface 108 is capable of both receiving and transmitting data.

For purposes of system 10, memory 28 may include a number of data structures including a raw data structure 102, skills table 104, and administrative data structure
10 106. Raw data 102 may include service agent information or client identifier data or any data to be manipulated by server 20. Administrative data 106 may include information such as data upload times, processing downtimes, or other data used to manage server 20 and
15 distributed system 10.

Much of the data is retrieved by interfaces 108. One interface 108 links server 20 to administrative workstation 26. This interface 108 allows the user of administrative workstation 26 to manipulate the data
20 contained in memory 28 on server 20.

In operation, server 20 receives service agent information 22 through interface 108. Processor 100 converts service agent information 22 into numeric values and stores the results in memory 28 in raw data structure
25 102. Next, processor 100 may utilize information stored in the administrative data structure 106 to determine the next update time for skills table 104. At the appropriate time, processor 100 utilizes the data from raw data structure 102 to update skills table 104.

30 Server 20 also generates an ordered list of service agent stations 16 using skills table 104. First, server 20 receives a request for service agent station 16 from

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In operation to dynamically updated skills table 104, server 20 compiles raw service agent information and stores the raw service agent information in memory 28. Next, server 20 associates at least one raw numeric value to at least one skill entry 126 in skills table 104. Once a raw numeric value is associated with skill entry 126, server 20 updates the entry using one or more mathematical calculations, including averaging or replacing the prior value with the new raw numeric value.

10 The example skills categories shown in skills table
104 are client satisfaction, French, average length of
session, and availability. Skills categories illustrated
in skills table 104 are merely exemplary. System 10
contemplates any other suitable category to assess the
15 performance of the service agent. Moreover, each
category may represent one or more calculations,
variables, manipulations, or other processing to arrive
at a meaningful, numeric measure of performance.

As an example, the "French" category measures and evaluates the service agent's proficiency in the language. The "average length of session" category could measure, for example, the average number of minutes or a supervisor rating of the average length of a communication session. The "availability" category measures the number of personal breaks taken by the service agent, the number of vacation or sick days, the number of hours worked, or any other measure of the service agent's workload. The "client satisfaction" category assesses whether there is a successful outcome to the communications session, how happy the user of client 12 was with the service agent's performance, or any other objective and/or subjective information about

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the service agent from the perspective of the user of client 12.

FIGURE 5 illustrates a flowchart of a method for routing a communication session received at a switch utilizing a dynamic service agent skills table. The method begins at step 150. The switch, at step 152, receives a communication request from a client. The passive client identifier data is retrieved at step 154.

A decision is made whether the client communication is routed through an automated agent at step 156. If the client did not communicate with an automated agent, then step 160 is next. Otherwise, step 158 is next. At step 158, the active client identifier data is retrieved utilizing the automated agent. The method then proceeds to step 160.

At step 160, a communication session profile is generated using two or more attributes of the client identifier data. One or more algorithms are applied to the communication session profile at step 162. The attributes of the modified profile are compared to the appropriate entries in the service agent skill table at step 164. The results of the comparison are prioritized utilizing additional algorithms at step 166.

At step 168, the prioritized results are used to generate an ordered list of service agent records. The unavailable service agents are removed from the ordered list of service agent records at step 170. The optimal service agent record is selected from the ordered list, at step 172, and the process ends at step 174.

FIGURE 6 illustrates a flowchart demonstrating the procedure for dynamically updating skills table. As illustrated in FIGURE 6, the process begins at step 200.

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